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Corallimorpharians (Anthozoa: Corallimorpharia) from the Argentinean Sea

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Abstract

Corallimorpharians are a relative small group of anthozoan cnidarians, also known as jewel sea anemones. They resemble actiniarian sea anemones in lacking a skeleton and being solitary, but resemble scleractinian corals in external and internal morphology, and they are considered to be the sister group of the stony corals. *Corynactis carnea* (=*Sphincteractis sanmatiensis*) is a small, common and eye catching species that inhabits the shallow water of northern Patagonia and the Argentinean shelf up to 200 m depth. *Corallimorphus rigidus* is registered for the first time from the southwestern Atlantic Ocean. It is a rather big and rare species that inhabits only the deep sea. Only two specimens were found at 2934 m depth in Mar del Plata submarine canyon, in an area under the influence of the Malvinas current, which may explain its occurrence. These two species are the only two known jewel sea anemones in the Argentinean sea and are reported and described herein.

Key words: Argentina, Benthos, Cnidaria, Corallimorphus, Corynactis

Introduction

The order Corallimorpharia comprises a relatively small group of soft bodied animals within Anthozoa. They are similar to actiniarians (true sea anemones) in lacking a skeleton and in being solitary, but resemble scleractinians (stony corals) in external, internal morphology (*e. g.* presence of acrospheres in tentacles, absence of basilar muscles, lack of ciliated tracts and weak mesenterial musculature) and cnidae (Carlgren 1949; Hand 1966; den Hartog 1980; Fautin 2011). It has many fewer species than actiniarians or scleractinians; hitherto there are four valid families and approximately 48 known valid species of corallimorpharians (see Fautin 2016; Sanamyan *et al.* 2015), and over 1200 species of sea anemones and 1300 scleractinian corals (Fautin 2016; Daly *et al.* 2007).

Corallimorpharia Carlgren, 1940 was created based on a group of species formerly placed among corals (Carlgren 1936, 1940). The phylogenetic position of the group was long debated (see Daly *et al.* 2007); upon the author, the group was more related to scleractinians or actiniarians, but recent studies support Corallimorpharia as the sister group to a monophyletic Scleractinia (Kayal *et al.* 2018; Wang *et al.* 2017; Lin *et al.* 2016). The families differ from each other based on tentacle arrangement, morphology and presence of acrospheres; and the genera are separated based on external and internal characters, like column shape, pedal disc, tentacle shape, number of tentacles per endocele, and sphincter (Carlgren 1949). No corallimorpharian has ever been recorded from the southwestern Atlantic Ocean (SAO) deep sea, since the deepest record from this area corresponds to *Corynactis carnea* Studer, 1879 from 199 m (Excoffon & Acuña 1995; Zamponi *et al.* 1998).

The family Corallimorphidae Hertwig, 1882, includes two valid genera and approximately 24 valid species (see Fautin 2016; Sanamyan *et al.* 2015). It includes almost half of the known species of corallimorpharians. *Corynactis* Allman, 1846 is the genus of corallimorpharians with the most valid species up to date (16 according to Fautin 2016). The species are usually small and asexual reproduction is not unusual, so they may be found in large numbers. The species usually inhabit shallow waters all over the globe except for Arctic and Antarctic waters. *Corallimorphus* Moseley, 1877, with about eight valid species, is the genus that includes the species more recently

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described (Fautin 2011; Sanamyan *et al.* 2015). The species of this genus have been found in almost all oceans, and all but *Cm. karinae* Sanamyan, Sanamyan & Schories, 2015 (which has been found from 30 m depth) inhabit the deep sea, and the specimens are usually big and solitary. Here, we describe the only two known species of jewel sea anemones from the southern region of the Atlantic Ocean: *Corallimorphus rigidus* Moseley, 1877 and *Corynactis carnea*; the former reported for the first time in the SAO.

Materials and methods

The specimens were collected by hand in shallow waters, and by fishing nets or trawls in deeper ones during oceanographic expeditions. Since 2007, several expeditions were made all along the shallow water of the Argentinean patagonic coast from 40º 48' S; 64º 04' W (San Antonio, Río Negro province) to 54º 53' S; 68º 13' W (Beagle Channel, Tierra del Fuego province). During 2009, 2012 and 2013 four expeditions were made to the continental shelf off Mar del Plata and Mar del Plata submarine canyon on board of the O/V *Puerto Deseado* (property of the Argentinean council of science—CONICET). During the oceanographic expeditions, 96 sampling stations were made (64 stations below 200 m), and over 300 specimens of sea anemones (*sensu lato*) were collected. The specimens were relaxed with menthol crystals, fixed in a 7% formalin/sea water solution and transferred to 70% ethylic alcohol after several months for long-term storage. Histological sections 6–8 µm thick from selected fragments of the specimens were made and stained with Azocarmin Triple Stain (Humason 1967). Measurements from undischarged cnida capsules were made from acrospheres, tentacles, column, pharynx and mesenterial filaments of both species (when possible) and measured using an optic microscope (1000x magnification). Cnidae nomenclature follows Mariscal (1974). The specimens studied were deposited in Museo Argentino de Ciencias Naturales "Bernardino Rivadavia" (MACN) in Argentina. The works only listed in the bibliographic lists of the species are not included in the references section of this work.

In order to look for additional specimens of *Corallimorphus* from the SAO, we revised the sea anemones collection of the MACN and Museo de La Plata (MLP, Argentina), and specimens deposited in the Zoological Museum of Hamburg (ZMH, Germany), collected in the SAO by the German O/V *Walter Herwig* during the years 1966, 1968, 1970/71 and 1978, studied by Karin Riemann-Zürneck.

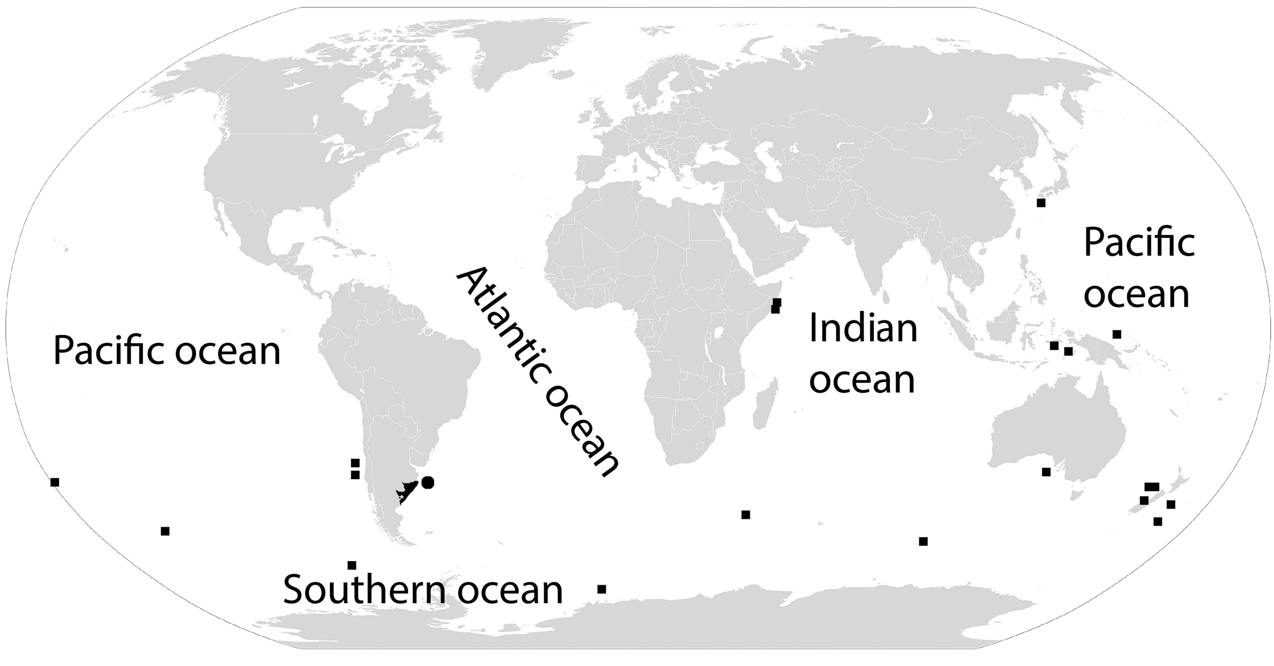

FIGURE 1. Distribution of *Corynactis carnea* and *Corallimorphus rigidus*. Black area corresponds to the distribution of *Corynactis carnea* in Argentina, the black circle corresponds to the new record of *Corallimorphus rigidus* and the black squares correspond to previous reports of *Corallimorphus rigidus* worldwide.

SYSTEMATICS

Order Corallimorpharia Carlgren, 1940

Family Corallimorphidae Hertwig, 1882

Corynactis carnea Studer, 1879

Corynactis carnea Studer 1879; Andres 1883; Andres 1884; Kwietniewski 1895; Duerden 1896; Haddon 1898; Duerden 1900; McMurrich 1904; Stephenson 1922; Carlgren 1927; Carlgren 1938; Carlgren 1941; Carlgren 1949; Carter Verdeilhan 1965; Riemann-Zürneck 1979; den Hartog 1980; Riemann-Zürneck 1986; den Hartog *et al.* 1993; Acuña & Zamponi 1995; Genzano *et al.* 1996; Häussermann & Försterra 2005; Rodríguez *et al.* 2007; Acuña & Garese 2009; Häussermann 2009; Garese *et al.* 2016; Fautin 2016.

Anemonia variabilis McMurrich 1893; Carlgren 1896; Pax 1907.

Anemonia carnea: McMurrich 1893.

Sphincteractis sanmatiensis Zamponi 1976; Riemann-Zürneck 1986; Zamponi & Acuña 1992; Acuña & Zamponi 1995; Excoffon & Acuña 1995; Genzano *et al.* 1996; Zamponi *et al.* 1998a; Zamponi *et al.* 1998b; Häussermann & Försterra 2005; Fautin *et al.* 2007; Rodríguez *et al.* 2007; Lauretta *et al.* 2009; Häussermann 2010; Fautin 2016.

Corynactis sanmatiensis: den Hartog *et al.* 1993; Fautin 2016.

Studied material. MLP 8504: *Sphincteractis sanmatiensis*, type (see discussion regarding this subject). Seven specimens in two jars (4+3).

MACN-IN 42230: several specimens. Punta Este, Chubut, Argentina 42º47.141'S 64º57.282'W, intertidal; coll. Daniel Lauretta, October 2007.

MACN-IN 42227: nine specimens. SAO, Argentinean exclusive economic zone, O/V "Puerto Deseado" Mejillón II expedition 38º14.278'S 57º09.313'W (St. 3), 51.4 m depth; coll. Daniel Lauretta, September 2009.

MACN-IN 42228: eight specimens. SAO, Argentinean exclusive economic zone, O/V "Puerto Deseado" Mejillón II expedition 39º01.384'S 58º02.146'W (St. 11), 140 m depth; coll. Daniel Lauretta, September 2009.

MACN-IN 42229: about 20 specimens. SAO, Argentinean exclusive economic zone, O/V "Puerto Deseado" Mejillón II expedition 36º39.868'S 55º09.779'W (St. 22), 50 m depth; coll. Daniel Lauretta, September 2009.

Description. External anatomy. Oral disc circular and flat, wider than column (preserved), in live specimens much wider than column and pedal disc (Fig. 2). Transparent or same color as column (Fig. 2a,b,c). Usually a more intense color ring on the margin (green, orange). Mesenterial insertion clearly visible. Mouth central, circular or oval, strongly elevated. Biggest specimen with 94 tentacles in up to four cycles (but many irregularities occur), in rows, to 4 (5?) in one endocele. Exocelic marginal tentacles bigger than endocelics. Stalk rugose due to the presence of cnidocysts batteries. External tentacles much longer than internal (to 2.1 mm and 0.5 respectively, preserved). All with well-developed acrospheres. Oral disc can cover the tentacles completely. Column smooth; fluorescent green, light violet, orange-brown or transparent (Fig. 2). Taller than wider (to 8.85 mm and 5 mm respectively, preserved). Mesenterial insertions visible, sometimes internal features also visible. Pedal disc usually round or elliptical, firmly attached to substratum and wider than column.

Internal anatomy. Longitudinal muscles of tentacles and oral disc ectodermal (Fig. 3a,b,d). Pharynx about 1/5 (rarely 1/2) of column length (preserved). Mesogloea thicker than other layers (to 110 µm at pharynx level), thicker in distal column than in proximal column, pedal and oral disc. Up to 64 mesenteries in 3 cycles (8+8+16=32 pairs), last cycle imperfect. Many irregularities found. Same number of mesenteries in proximal and distal part of column. All oldest mesenteries and some younger fertile. One siphonoglyph attached to a pair of directives. Retractor muscles diffuse, weak (Fig. 3f). No basilar nor parietobasilar muscles (Fig. 3e). Sphincter endodermal, diffuse, weak but clearly visible (Fig. 3a,c).

Cnidae. The cnidom of *C. carnea* includes spirocysts (in acrospheres, tentacles, mesenterial filaments and pharynx), holotrichs (in acrospheres, column, mesenterial filaments and pharynx), microbasic *b*-mastigophores (in acrospheres, column, mesenterial filaments and pharynx) and microbasic *p*-mastigophores (in all tissues), although some cnida types are very scarce and may be contamination (see Fig. 4 and Table 1).

TABLE 1. Size range of the cnidae of *Corynactis carnea*

Categories	Range of length and width of capsules (µm) (length x mean)	x̄ ± SD	N	S
ACROSPHERES				
Spirocysts (a)	(21.9–57.6) x (2.2–4.1)	37.5 ± 9.1 x 3.3 ± 0.5	36	6/6
Holotrichs (b)	(65.4–87.1) x (11.8–27.1)	77.8 ± 5.3 x 16.0 ± 2.5	36	5/6
M b-mastigophores (c)	(3.1–51.0) x (3.8–7.3)	38.2 ± 5.3 x 4.7 ± 1.0	20	6/6
M p-mastigophores 1 (d)	(28.6–36.1) x (4.1–7.1)	31.9 ± 2.8 x 5.8 ± 1.1	12	4/6
M p-mastigophores 2 (e)	(40.7–75.0) x (4.3–6.8)	57.2 ± 9.6 x 5.4 ± 0.6	19	5/6
TENTACLES				
Spirocysts	(21.0–41.4) x (2.4–6.1)	30.7 ± 5.4 x 3.6 ± 0.7	36	4/4
M b-mastigophores*	(16.5–28.9) x (4.3–4.5)	-	2	1/4
M p-mastigophores*	(63.3) x (6)	-	1	1/4
COLUMN				
Holotrichs (f)	(44.1–56.9) x (9.7–13.6)	50.3 ± 3.2 x 12.3 ± 1.1	28	3/6
Holotrichs	(79.0–90.7) x (26.4–26.9)	85.7 ± 4.3 x 25.3 ± 2.0	5	1/6
M b-mastigophores (g)	(13.8–20.6) x (2.2–4.2)	17.6 ± 2.2 x 3.3 ± 0.5	11	3/6
M p-mastigophores (h)	[21.9](26.8–28.6) x (5.9–7.5)	27.5 ± 0.7 x 6.2 ± 0.7	6	4/6
M p-mastigophores	(39.9–50.5) x (6.4–8.4)	45.3 ± 4.1 x 7.6 ± 0.7	7	4/6
PHARYNX				
Spirocysts*	(30.6) x (28.9)	-	1	3/6
Holotrichs (i)	(34.6–50.3) x (8.6–14.0)	42.0 ± 3.5 x 11.6 ± 1.3	38	6/6
Holotrichs*	(73.3–79.1) x (14.3–25.3)	-	3	2/6
M b-mastigophores (j)	(25.0–36.0) x (3.2–5.2)	29.6 ± 3.7 x 3.9 ± 0.5	14	4/6
M p-mastigophores (k)	(21.9–37.5) x (5.6–9.2)	-	3	3/6
MESENTERIAL FILAMENTS				
Spirocysts*	(27.2–32.1) x (2.9–3.2)	-	2	4/6
Holotrichs (l)	(66.9–92.3) x (19.6–30.1)	80.6 ± 6.1 x 24.2 ± 2.4	40	6/6
M b-mastigophores*	(24.1–34.9) x (3.3–4.8)	27.9 ± 4.8 x 4.0 ± 0.6	4	2/6
M p-mastigophores (m)	(19.6–41.1)[47.2] x (5.2–10.5)	32.8 ± 5.9 x 8.3 ± 1.3	44	6/6

x̄: mean. SD: standard deviation. N: total number of capsules measured. S: ratio of number of specimens in which each type of cnida was found to number of specimens examined. "-" means that the cnida type has not been found or that mean and standard deviation have not been calculated. Values between [] correspond to rare values. Abbreviations: M, Microbasic. * indicates possible contamination.

Distribution and Natural History. *Corynactis carnea* is the most common and abundant corallimorpharian of the region. It can be found in the shallow waters of northern Patagonia, from San Matías gulf to Bahía Bustamante (Rio Negro and Chubut) and south of Buenos Aires province (in deeper waters) (Fig. 1), always associated with hard substratum, like rocks or the tubes of the polychaetes *Eunice argentinensis* (Treadwell, 1929) and *E. frauenfeldi* Grube, 1866 (identify by S. Calla). It is also common in the Argentinean continental shelf, where it can be found up to 199 m deep (Excoffon & Acuña 1995; Zamponi *et al.* 1998). It is usually found in groups of several specimens displaying the same color pattern (Fig. 2a, d). Asexual reproduction present; many specimens were connected by the pedal disc. The geographic location of some specimens of Zamponi (1976) were mistakenly placed on earth: St. 17 (41º05'S; 67º07'W) and St.110 (41º13'S;65º59'W), as noted by Riemann-Zürneck (1986).

Remarks. *Corynactis carnea* was first described by Studer (1879) from specimens collected off Buenos Aires (Argentina). McMurrich (1893) described specimens from about 430 km south from Studer's specimens under a different name, but acknowledged that both species were the same and used the name *Anemonia carnea*. Zamponi (1976) described *Sphincteractis sanmatiensis* Zamponi, 1976 from 115 specimens collected in the San Matías gulf from 16.5 to 98 m. He placed the species in Sideractidae Danielssen, 1890, a family of species with only one tentacle per endocoel and exocoel, and since the specimens present a marginal sphincter, he created a new genus *Sphincteractis* Zamponi, 1976. Several works indicate with more or less confidence that *S. sanmatiensis* and *C. carnea* are the same species (Riemann-Zürneck 1979, 1986; den Hartog *et al.* 1993; Rodríguez *et al.* 2007; Häussermann 2009). den Hartog *et al.* (1993) stated that *C. sanmatiensis* is "undoubtedly a junior synonym of *C. carnea*", but it is listed as a valid species in Fautin's (2016) work as *Corynactis sanmatiensis*.

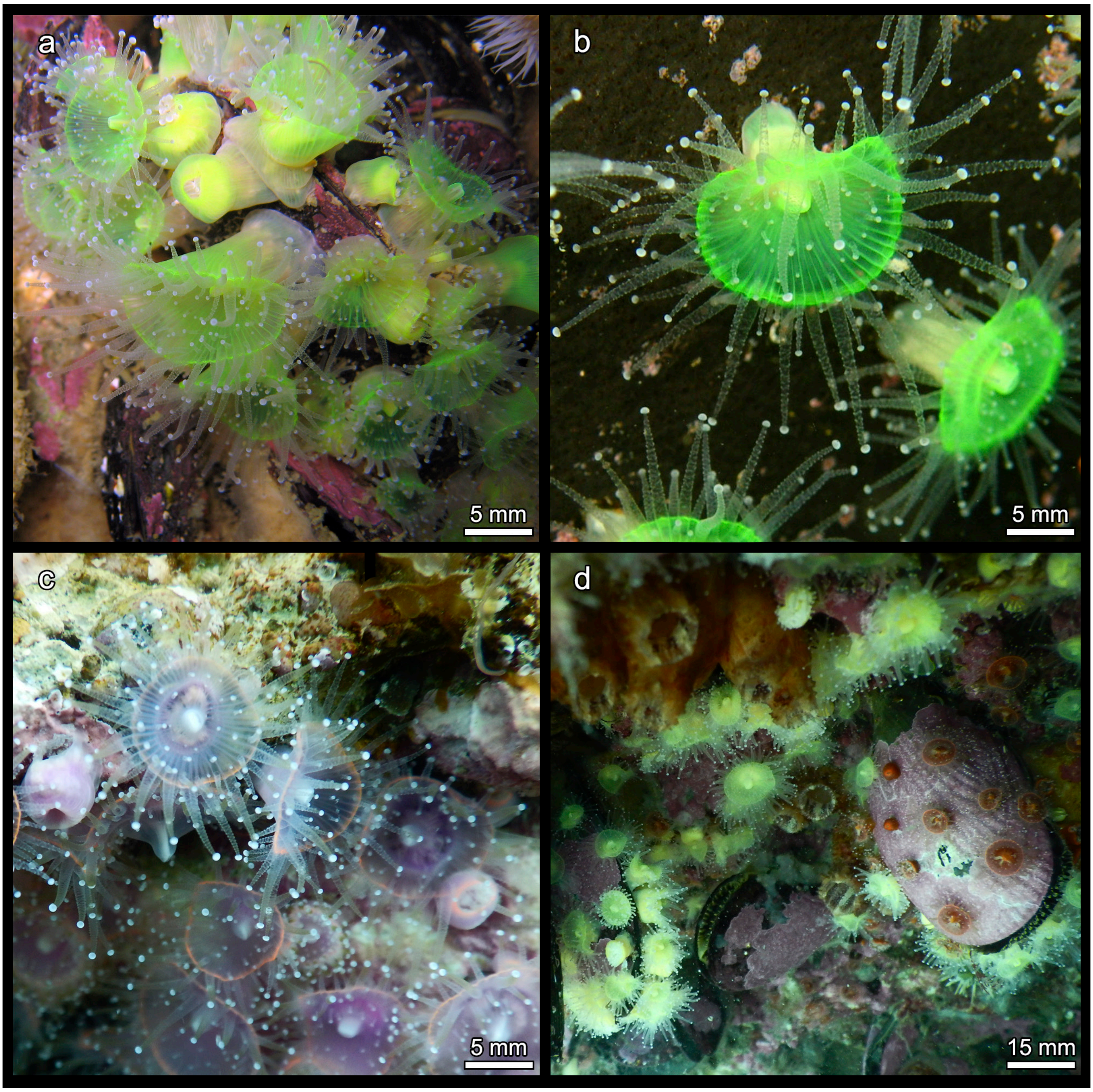

FIGURE 2. Live specimens of *Corynactis carnea* from between 5-10 m depth, Puerto Madryn.

We studied the specimens of *S. sanmatiensis* of lot MLP 8504. The type lot (MLP 8504) is actually two different jars, with seven specimens in total. One of the jars (the one with three specimens) has a label in manuscript with the name *Sphincteractis sanmatiensis* and all the station numbers mentioned in the paper; there is no indication of status of the specimens (e.g. holotype, syntype). The other lot (with four specimens) has no manuscript label, but a label made with a printer that says in its left lower corner "sintipos"; this label was not made by Zamponi. One of the seven specimens is the holotype stated by Zamponi, but it is not possible to indicate which one (nor the type locality) based on the information stated in the paper or in the label. Fautin (2016) stated that the type is not a holotype as indicated in the original description, but a syntype constituted by four specimens (they are actually seven in two jars, but she probably only knew about one jar). We prefer to keep it as a holotype (as designated in the original

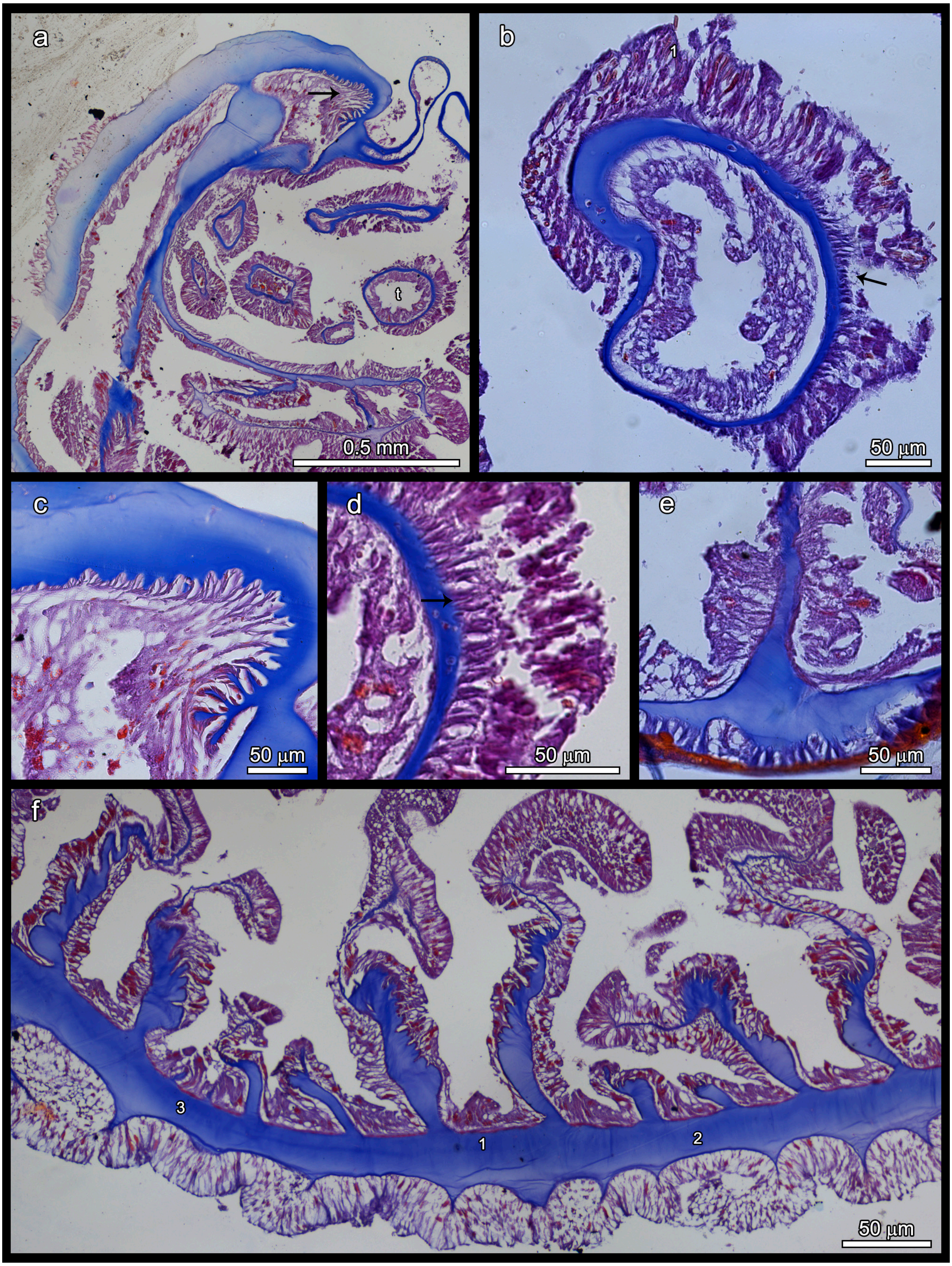

FIGURE 3. Internal anatomy of *Corynactis carnea*. (a) longitudinal section of distal part of the column, arrow points to sphincter muscle; (b) cross section of a tentacle, arrow points to ectodermal muscle; (c) detail of the sphincter; (d) detail of muscles (arrow) of the oral disc; (e) longitudinal section showing the junction between the mesenteries and the pedal disc; (f) cross section showing the mesenterial arrangement; the numbers indicate the mesenterial order. T, tentacle.

description of the species), even when it is not possible at this moment to be sure which of the seven specimens is the holotype. The specimens are not in good conditions and it was not possible to locate the 114 (?) paratypes. We found in at least one of the specimens two tentacles in line, so we agree that *Sphincteractis* is a junior synonym of *Corynactis*. Based on the coloration pattern and anatomy described by Zamponi (1976) and cnida sizes and distribution we also agree that *C. sanmatiensis* is a junior synonym of *C. carnea*.

The internal anatomy of this species is more or less variable (*e. g.* number of perfect mesenteries, directives, fertile mesenteries, etc.), probably as a result of asexual reproduction. The cnidae in our specimens is in line with previous records. The cnida from one of the specimens from the lot MLP 8504 were in line with our results (although only few capsules were found). Sizes are compatible with Carlgren (1927), although no differentiation between cnida types were done (except for spirocysts). Zamponi (1976) did not report size of cnidae, but Zamponi & Acuña (1992), Acuña & Zamponi (1995) and Garese *et al.* (2016) did. Although there are some differences in cnida sizes, this may be due to the low number of capsules found in our specimens and variability between different specimens. Garese *et al.* (2016) have shown the intraspecific variation of cnida sizes in this species.

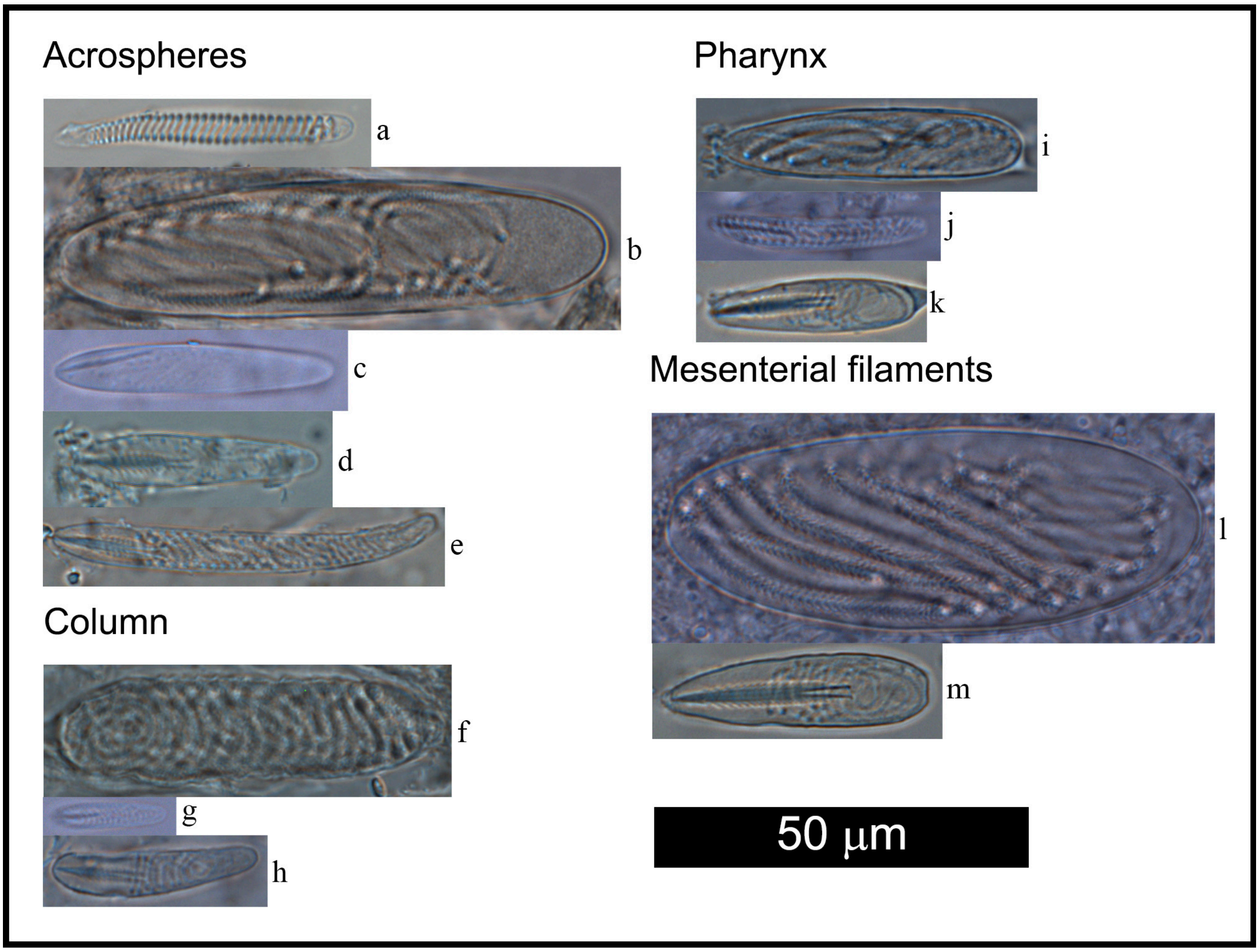

FIGURE 4. Cnidocysts of *Corynactis carnea*. Spirocyst: a; holotrichs: b, f, i and l; microbasic *b*-mastigophores: c, g and j; microbasic *p*-mastigophores: d, e, h, k and m.

Zamponi (1976) found gametes in specimens collected between 16.5–80 meters deep (San Matías gulf); but Acuña & Zamponi (1995) did not find gametes in specimens from the intertidal zone of Puerto Madryn (Nuevo Gulf). We also failed to find gametes in our specimens from the intertidal zone, but we did find them in specimens from "Mejillón II" expedition (50–140 m). Since it was possible to find evidence of asexual reproduction in intertidal specimens, it is possible that this strategy of reproduction is preferred over sexual reproduction in those conditions, although a detail reproductive study of the species in both areas is needed to confirm this observation.

There is some hesitation about the validity of species of *Corynactis* from the southern hemisphere (see den Hartog *et al.* 1993). Since *Corynactis* populations of Argentina and Chile seem not to be connected, we prefer to maintain both species separated. *Corynactis viridis* Allman, 1846 has been reported from Cabo Frío, Brazil (den

Hartog 1980; den Hartog *et al.* 1993). Although den Hartog *et al.* (1993) hesitate for geographic reasons about the affinity of these specimens with *C. viridis* from the northern hemisphere, they were unable to distinguish them. They indicate that if the brazilian specimens really are *C. viridis* then *C. carnea* may also be so (den Hartog *et al.* 1993). We agree that it is necessary to perform a study using morphological and molecular information to evaluate the validity of *C. viridis*, *C. carnea*, *C. chilensis* Carlgren, 1941 (separated from *C. carnea* by Carlgren in 1941) and *C. annulata* (Verrill, 1867).

***Corallimorphus rigidus* Moseley, 1877**

Corallimorphus rigidus Moseley 1877; Hertwig 1882; Andres 1883; Andres 1884; Hertwig 1885; Hertwig 1888; Haddon 1898; Delage & Hérouard 1901;Gravier 1904; McMurrich 1904; Stephenson 1920; Stephenson 1922; Carlgren 1928; Carlgren & Stephenson 1929; Weill 1934; Carlgren 1934; Carlgren 1943; Carlgren 1949; Fautin 1984; den Hartog *et al.* 1993; Fautin *et al.* 2002; den Hartog & Grebelny 2003; Häussermann & Försterra 2005; Häussermann 2006; Rodríguez *et al.* 2007; Häussermann 2009; Fautin 2011; Rodríguez & López-González 2013, Sanamyan *et al.* 2015; Fautin 2016.

Corynactis: Hertwig 1888; Carlgren 1900; Stephenson 1920; Stephenson 1922; Carlgren 1943; Carlgren 1949; Rodríguez & López-González 2013; Fautin 2016.

Corallimorphus obtecus Hertwig 1888; Stephenson 1920; Stephenson 1922; Carlgren 1928; Carlgren & Stephenson 1929; Carlgren 1949; Fautin 1984; Fautin *et al.* 2002; Rodríguez & López-González 2013; Fautin 2016.

Corynactis hertwigi Haddon 1898; Fautin 2016.

Isocorallion hertwigi: Carlgren 1900; Stephenson 1922; Carlgren 1949; Fautin 1984; Rodríguez & López-González 2013; Fautin *et al.* 2002; Fautin 2016.

Chalmersia sp. Delage & Hérouard 1901; Stephenson 1922; Carlgren 1949; Fautin 1984; Rodríguez & López-González 2013; Fautin 2016.

Studied material. MACN-IN 42226: Two specimens. SAO, O/V "Puerto Deseado" Talud Continental expedition 38º1.913'S 53º39.268'W (St. 45), 2934 m depth; coll. Daniel Lauretta, September 2013.

Description. External anatomy. One big and one small specimen. Oral disc circular and flat, wider than column (23–37 mm in diameter), pale pink (Fig. 5a); mesenterial insertions clearly visible, mesogloea much thicker than in column or pedal disc, ectoderm almost completely lost in both specimens. Mouth central, circular, to 6 mm wide, in highest part of the oral disc (Fig. 5a). Four cycles of non retractile tentacles plus and incomplete fifth cycle (Fig. 5a), mainly without ectoderm (Fig. 6a, d), almost all with acrospheres (most tentacles lost in small specimen). About 48 marginal tentacles and 24 discal tentacles (2:1 rate marginal: discal tentacles). Tentacles 1.5–11 mm in length. Marginal tentacles longer than discal tentacles. Up to two tentacles per endocele. Column smooth, pale pink, short, wider than taller (5–8 mm in length 21.5–35.2 mm in diameter), rather firm due to the thick mesogloea (Fig. 6a). Distal part of the column wider than proximal part. Pedal disc circular and flat, smaller in diameter than oral disc (17.5–30.5 mm in diameter) (Fig. 5b), almost entirely without ectoderm (confirm by histology sections); mesenterial insertions visible (Fig. 5b).

Internal anatomy. Pharynx length about 1/3 of column length. Mesogloea hyaline, much thicker than endoderm (to 550 µm in oral disc and to 90 µm in pedal disc). Mesenteries in three cycles, two perfect and one imperfect (6+6+12=24 pairs of mesenteries). Same number of mesenteries in proximal and distal part of column. All mesenteries fertile, spermatic cyst to 205 µm (Fig. 6c, f). No siphonoglyphs nor directives found. Retractor muscles diffuse, very weak, only visible in histological preparations (Fig. 6c, e). Marginal sphincter muscles and basilar muscles absent (Fig. 6a, b).

Cnidae. The cnidom includes spirocysts (in tentacles), holotrichs (in acrospheres, pharynx and mesenterial filaments), microbasic *b*-mastigophores (in acrospheres and mesenterial filaments) and microbasic *p*-mastigophores (in acrospheres, tentacles and mesenterial filaments) (Fig. 7 and Table 2). All round microbasic *p*-mastigophores from tentacles and mesenterial filaments are considered contamination (see remarks).

Since both specimens were almost entirely devoid of ectoderm, and there were very few capsules in each slide made, cnidocysts from both specimens were pooled, when possible; the cnidom of the species is possibly incomplete.

Distribution and Natural History. Previous records of this species indicate that it has a wide distribution, especially in the southern hemisphere (Fig. 1). It has been recorded from the South Pacific and Indian oceans, but not from the South Atlantic; record of *Cm. rigidus* in Argentine basin by Fautin (1984) is incorrect. The new specimens of *Cm. rigidus* were found in the SAO, about 350 km off Mar del Plata city (approx. 38ºS) at 2934 m depth (Fig. 1). The sample was taken with a fishing net but, inferring from the sediment collected along with the specimens (mud with a few rocks), the specimens seem to live in soft bottoms, not attached to stones or any hard substratum. Previous studies of sea anemones from the area failed to recollect specimens from this species. None took samples beyond 1200 m deep, so it is possible that the species inhabits only in deeper waters at this latitude.

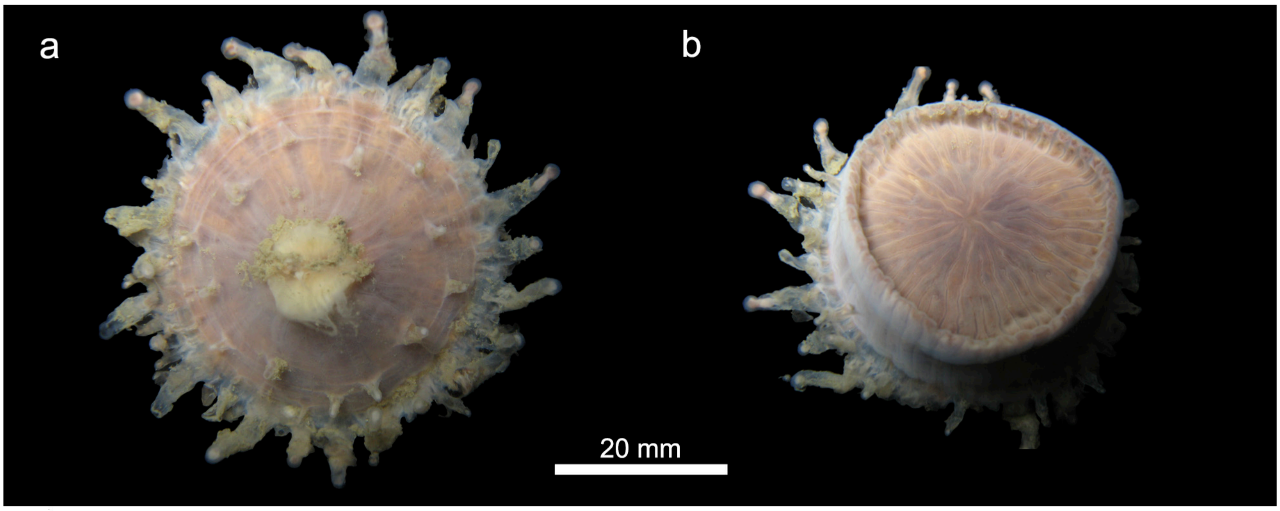

FIGURE 5. Shape and color of a specimen of *Corallimorphus rigidus* directly after collection. (a) Oral view; (b) Pedal view.

Remarks. *Corallimorphus* is a cosmopolitan genus, ranging from 30 to 4648 m (Fautin 2011; Rodríguez & López-González 2013; Sanamyan *et al.* 2015). Specimens from the group have been found in all oceans, except for the Arctic and the South Atlantic Oceans. Fautin (1984) studied specimens of *Cm. rigidus* and *Cm. profundus* Moseley, 1877 from Antarctica and discussed the status of the species known at that time, stating that *Cm. atlanticus* was likely to be synonymous of *Cm. rigidus*. This view was not accepted by den Hartog *et al.* (1993), who identified one specimen collected in the Azores as *Corallimophus.* cf. *atlanticus*. Our specimens present some differences with the other species recorded from the Atlantic Ocean, *Cm. atlanticus*, which prevent us from identifying our specimen with it. Based on the description made by den Hartog *et al.* (1993) our specimens have a smaller relation oral disc diameter: column length (approx. 0.22 *vs* 0.3), the tentacles are larger (to 11 mm vs 5 mm), the discal tentacles are small but well developed (almost vestigial in *Cm. atlanticus*), they are clearly arranged in three cycles and the mesogloea is thinner. Finally, all the known records of *Cm. atlanticus* are located in the North East Atlantic, while our records correspond to the SAO (over 8500 km apart). When describing *Cm. niwa* Fautin (2011) made a redefinition of the family and a revision of the genus, but Sanamyan *et al.* (2015) described a new species in the genus (*Cm. karinae*) and rejected the synonymization of *Cm. profundus* and *Cm. antarcticus* (both names were suggested to be synonyms by Fautin 1984). Rodríguez & López-González (2013) accepted the synonymization of both, so the status of the species is under discussion. Other species of the genus has been reported somewhat close to Argentinean waters. *Corallimorphus profundus* was found in the south Pacific and Antarctic deep water (Fautin 1984). This species is characterized by having a marginal: discal tentacle ratio of about 4:1 (*vs.* 2:1 in *Cm. rigidus*) and longer tentacles (up to 40 mm *vs.* 11 mm in our specimens), which prevents us to identify our specimens with it.

We could not find the lanceolate microbasic *b*-mastigophores in the acrospheres (also reported as lanceolate basitrichs by Riemann-Zürneck & Iken 2003) reported for other species (*e. g. Cm. profundus*, *Cm. rigidus*, *Cm. ingens* Gravier, 1918 and *Cm. karinae*). This cnida type is not reported for all species, but it has been suggested to have generic significance (Riemann-Zürneck & Iken 2003). The lack of ectoderm in our specimens prevented a more detailed study of the cnidae (as in other works), so the absence of some categories may be a consequence of the low number of capsules found.

Although tentacle cnida data between both specimens agree, all the round microbasic *p*-mastigophores found in the tentacles and mesenterial filaments are to be treated as contamination (possibly by feeding). There was little remaining ectoderm on the tentacles of the specimens. Histological section failed to prove the presence of cnida in the ectoderm of the tentacles but revealed some free capsules inside them (especially the round microbasic *p*-mastigophores). The lack of ectoderm could also explain the lack of other cnida type, like lanceolate microbasic *b*-

mastigophores. Nevertheless, there are some differences between our specimens cnida and those reported elsewhere from *Cm. rigidus*. Our specimens have smaller (but overlapping) holotrichs and microbasic *b*-mastigophores in acrospheres, holotrichs with wider size range in the pharynx and smaller (but overlapping) microbasic *p*-mastigophores in the mesenterial filaments (table 2).

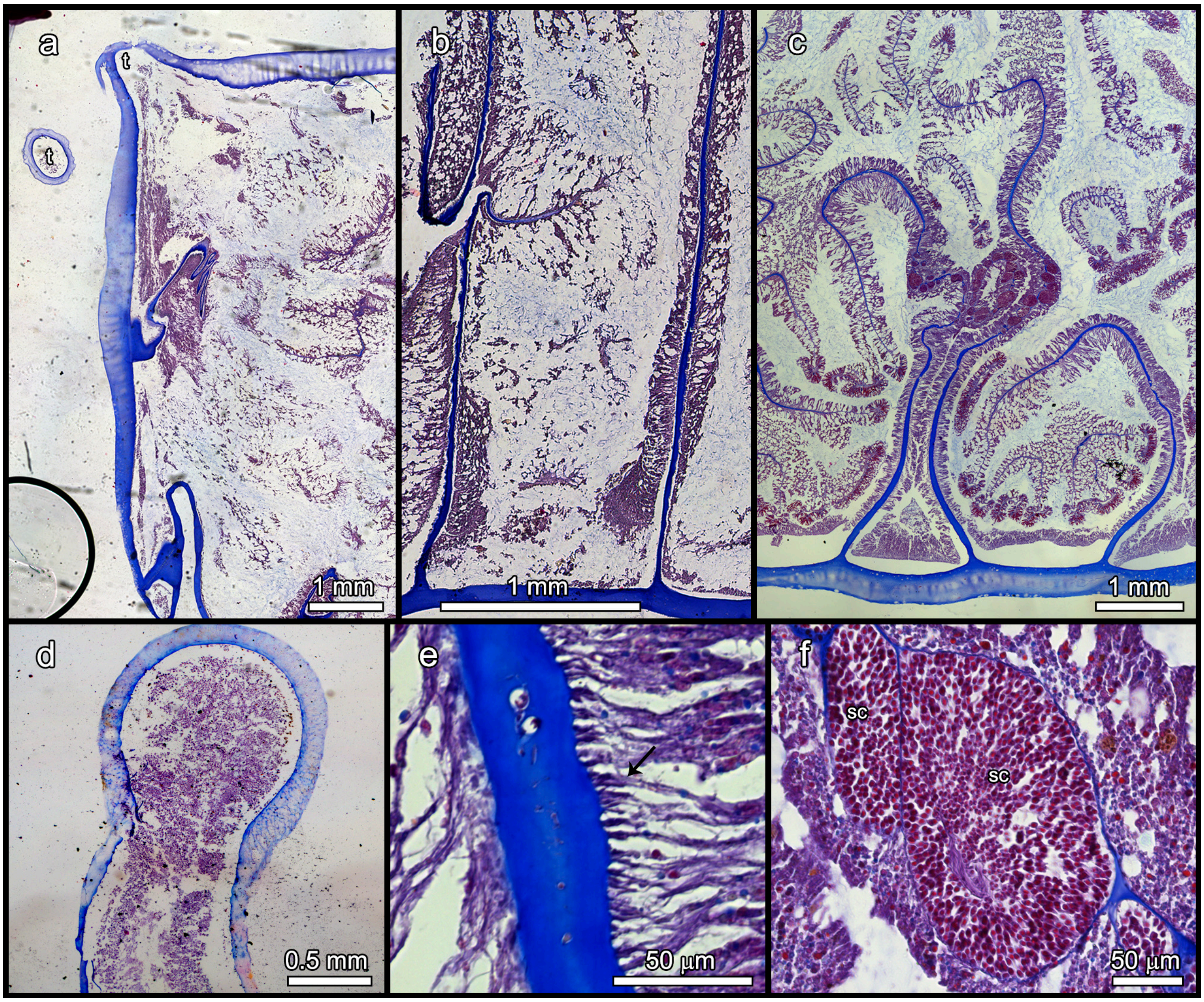

FIGURE 6. Internal anatomy of *Corallimorphus rigidus* (a) longitudinal section, note the lack of marginal sphincter; (b) longitudinal section showing the junction between the mesenteries and the pedal disc; (c) cross section showing the mesenteries; (d) longitudinal section of a tentacle; (e) detail of mesenterial muscle (arrow); (f) spermatic cysts. T, tentacles; SC, spermatic cyst.

Discussion

Although there are only two species of corallimorpharians in Argentinean waters, they are not rare. *Corynactis carnea* is a conspicuous and eye-catching part of the benthic community in the northern Patagonian region of the Argentinean sea. It is usually found in association with other invertebrates in an abundant fashion. Nevertheless, it is not often mentioned in the literature, probably because it is difficult to identify sea anemones (*sensu lato*). The pictures and geographical distribution provided in this work will facilitate the identification of the species in the field and their inclusion in future works, although the affinity of these species with other southern species of *Corynactis* requires a detailed study.

Corallimorphus rigidus is a rare species that inhabits only deep waters. This explains why it has not been recorded earlier, since it is a rather big and characteristic species. The new finding of a cosmopolitan deep-sea genus in Argentinean waters reflects the lack of knowledge about the biodiversity of a major zone of the Atlantic Ocean. The specimens were found in an area under the influence of the Malvinas current, a northward branch of the Antarctic

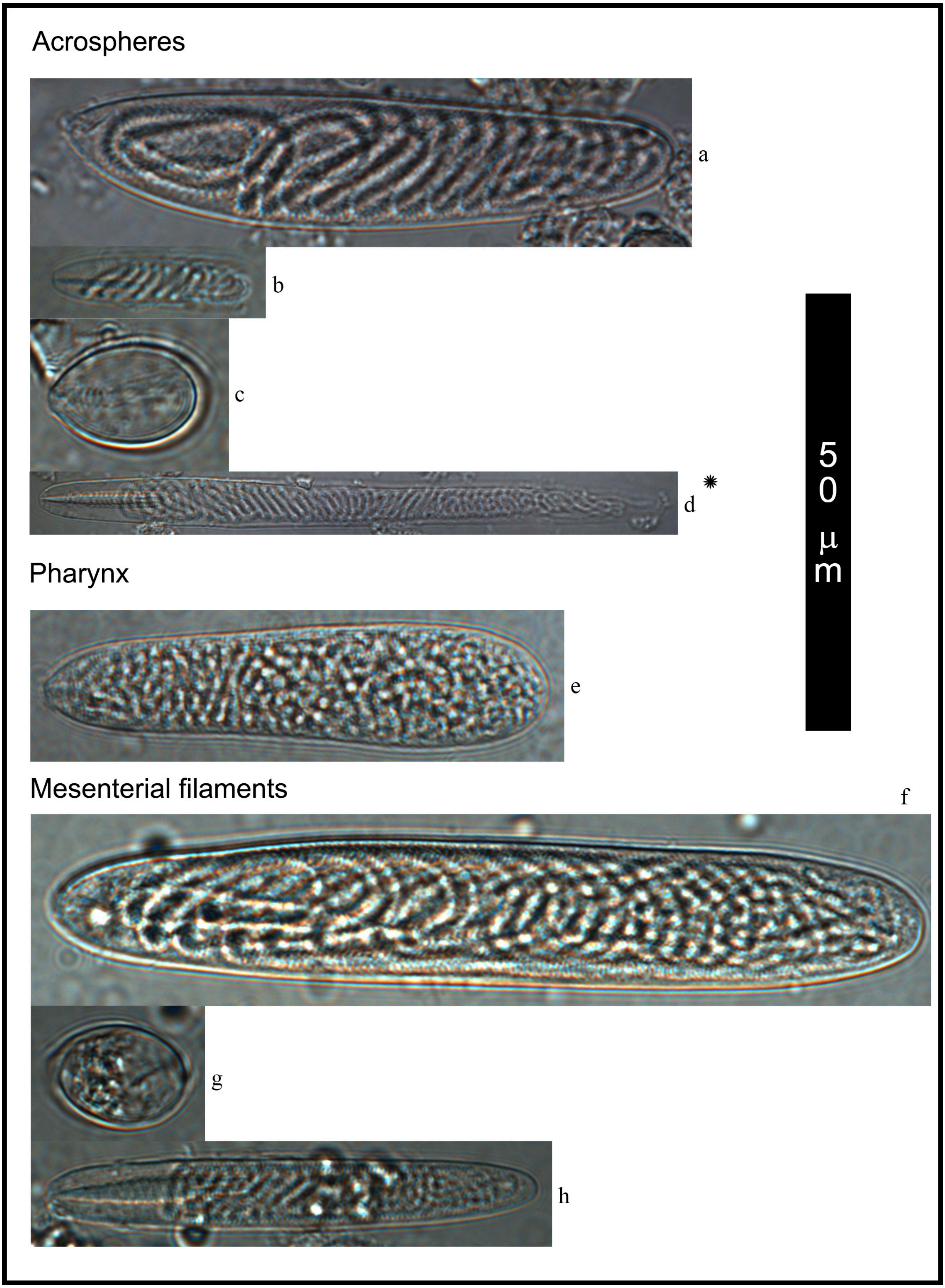

FIGURE 7. Cnidocysts from *Corallimorphus rigidus*. Holotrichs: a, e and f; microbasic *b*-mastigophores: b; microbasic *p*-mastigophores: c, d, g and h. * cnida capsule reduce 50% of its size with respect to the scale. c and g probably contamination (see text).

TABLE 2. Size range of the cnidae of *Corallimorphus rigidus*

Categories	**Range of length and width of capsules (µm) (length x mean)**	**$\bar{x}$ ± SD**	**N**	**S**	**Range of length and width of capsules (µm) (Carlgren 1943)**	**Range of length and width of capsules (µm) (Fautin 1984 and Rodríguez & López-González 2013*)**
ACROSPHERES						
Basitrichs	(23.2–27.8) x (4.5–4.6)	-	2	1/2	-	-
Holotrichs (a)	(37.9–59.0)[92.7] x (7.8–12.0)[19.8]	48.0 ± 5.5 x 9.2 ± 1.2	10	2/2	(43.0–89.0) x (7.0–10.0) (129.0–197.0) x (12.7–19)	*(122.5) x (10.0)*
M b-mastigophores (b)	(15.9–34.7) x (4.7–7.4)	26.2 ± 4.1 x 6.1 ± 0.7	44	2/2	(32.4–45.3) x (3.0–4.2)	*(70.0–90.0) x (5.0–6.0)*
M p-mastigophores 1 (c)	(8.3–19.4) x (6.4–13.1)	16.5 ± 2.5 x 11.3 ± 1.4	51	2/2	(84.6–139.0) x (4.2–7.5)	-
M p-mastigophores 2 (d)	[65.6](145.1–163.1) x (7.1–11.0)	-	4	2/2	(134.0–194.0) x (11.5–17.0)	*(137.0–180.0) x (7.5–10.0)*
Spirocysts	(163.1) x (7.1)	-	1	1/2	No data	*(43.0–54.0) x (4.0–6.0)*
BASAL PART OF TENTACLE						
Spirocysts	(26.0–31.8) x (3.5–5.0)	-	2	1/1	-	-
M p-mastigophores	(50.6) x (8.4)	-	1	1/1	-	-
PHARYNX						
Holotrichs (e)	(47.0–99.9) x (8.4–16.7)[24.8]	62.1 ± 10.0 x 11.4 ± 1.6	38	2/2	(35.2–52.2) x (7.0–11.3) (57.8–84.6) x (14.0–16.9)	(67.2–77.0) x (11.5–13.1) *(69.0–84.0) x (12.0–20.0)*
MESENTERIAL FILAMENTS						
Holotrichs (f)	(63.9–106.5) x (10.0–20.4)	95.0 ± 8.7 x 17.3 ± 2.1	35	2/2	(35.2–45.0) x (7.0–11.3) (59.2–84.6) x (14.0–22.6)	(50.0–76.3) x (9.1–16.2) *(103.0–122.0) x (11.0–21.0)*
M b-mastigophores	(16.7–22.2) x (5.1–6.5)-	19.5 ± 1.8 x 5.9 ± 0.6	6	1/2	-	(18.6–31.2) x (4.5–6.8) *(16.0–21.0) x (5.0–7.0)*
M p-mastigophores 1 (g)	(10.2–22.4) x (6.6–17.1)	16.8 ± 2.9 x 11.6 ± 2.2	19	2/2	-	-
M p-mastigophores 2 (h)	(45.7–67.8) x (6.3–10.3)	57.5 ± 7.4 x 8.4 ± 1.0	11	2/2	(35.2–53.6) x (7.0–10.0)	*(61.0–78.0) x (8.0–10.0)*

$\bar{x}$: mean. SD: standard deviation. N: total number of capsules measured. S: ratio of number of specimens in which each type of cnida was found to number of specimens examined. "-" means that the cnida type has not been found or that mean and standard deviation have not been calculated, meanwhile "no data" means that the cnida is present but there are no measures available. Values between [] correspond to rare values. Abbreviations: M, Microbasic. The measures from Carlgren´s work were pulled together and the minimum and maximum values are given; when Carlgren distinguished two size categories within a cnida type they were kept separate. * Values from Rodríguez and López-González (2013) in italics.

Circumpolar Current, which transports subantarctic waters equatorward (Piola & Matano 2001). Since this species seems to have a circumpolar distribution, the presence of the specimens in the deep sea off Mar del Plata seems to be related to the transport of the Malvinas current, so it is possible that the species has a larger distribution along the deep sea off Argentina.

The South Atlantic is in direct contact with the waters surrounding Antarctica. Since there are water masses of subantarctic origin in the SAO, the knowledge of the diversity in the area will not only increase the knowledge of faunal similarity between both regions, but also help to obtain a better knowledge of the connections between the zones. Many deep-sea invertebrates have planktonic larvae, which may be transported by the oceanic currents like the Brazil, Circumpolar or Malvinas currents.

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